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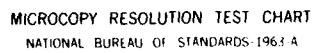
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A technique for staining extracted teeth: a
research and teaching aid for bleaching

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ABSTRACT

This study developed a technique for staining extracted teeth. Its possible value in research comparisons of bleaching techniques, or as an aid in teaching students bleaching techniques is discussed.

The principal causes of discoloration in non-vital pulpless teeth are stated as: 1) decomposition of pulp tissue; 2) excessive hemorrhage following pulp removal; 3) trauma; 4) medicaments; and 5) filling materials.¹

Grossman¹ stated that decomposition of pulp tissue is the most common cause of tooth discoloration. Pulpal hemorrhage from trauma is probably the most likely factor for the deeply discolored tooth.² As a result of the trauma, blood vessels rupture, allowing the blood to be extravasated into the pulp chamber. Some of the red blood cells themselves may be drawn up into the dentinal tubules. The freed red blood cells then undergo hemolysis and emit hemoglobin. The hemoglobin is further degraded, and releases iron which combines with hydrogen sulfide to form iron sulfide. The iron sulfide is a black compound which penetrates into the dentinal tubules and stains the crown of the tooth.³

A model that simulates the above phenomenon has not been previously developed. It is the purpose of this study to develop a technique for staining extracted teeth. These teeth can then be used in research to evaluate bleaching techniques, or by students to practice bleaching procedures.

Materials and Methods

Ten extracted anterior teeth with intact crowns were scaled with an ultrasonic scaler^φ and polished with a rubber cup and pumice to remove all extrinsic debris. A 35mm SLR camera with bellows and 100mm lens was used to photograph the teeth before the staining procedure (Fig 1). Standard shade guides^{#+} were also employed for assessment of color

^φ Powermatic(R) Cavitron Corp., Long Island City, NY

[#] VITA Lumin Vacuum Shade Guide, Vita Zahnfabrik Säckingen

⁺ Myerson Standard Shade Guide, Myerson Tooth Corp., Cambridge, MA

before and after the staining procedure.

Lingual access openings were prepared in the teeth, the pulps extirpated, and the root canals instrumented with #10 to #20 files. The teeth were then placed in 5.25% sodium hypochlorite solution for 24 hours to open the dentinal tubules.

The teeth were immersed in individual test tubes containing samples of whole blood (minus the serum). In order to hemolyze the red blood cells and have the breakdown products penetrate the dentinal tubules, a high-speed centrifuge was used to centrifuge the samples at 10,000 RPM's for 10 minutes at 37°C twice each day for three consecutive days. Distilled water was then added to the blood samples (without teeth) and centrifuged to further hemolyze the red blood cells. This resulted in two layers present in the test tubes - a precipitate containing the cell membranes and a hemolysate containing the hemoglobin protein. The hemolysate was separated from the precipitate, placed back in the individual test tubes with the teeth, and centrifuged for three additional days as described previously.

Subsequent to this, the teeth were rinsed with running tap water for 2 minutes to remove the excess blood pigment, and air dried. The teeth were again photographed (Fig 2).

Results

When compared to the original shades recorded from the shade guides and the original photographs, the results of this procedure demonstrated that all the teeth were stained darker than the darkest shade guide tooth (Fig 2). The experimentally stained teeth closely resembled discolored

non-vital teeth observed in vivo that are candidates for bleaching treatment.

Discussion

The discoloration of non-vital teeth is an important psychological and esthetic concern to both the patient and the dentist.⁴ Hence, the bleaching of these discolored non-vital teeth becomes an extremely important phase of endodontic therapy.¹⁻⁶

Apparently only a small percentage of dental students ever receive the opportunity to bleach even one tooth before they graduate. Thirty-four out of 50 dentists at the Edward C. Penick Endodontic Study Club stated they never bleached a tooth as an undergraduate. Six chairmen of dental school endodontic department were also asked what percentage of their undergraduates had the opportunity to bleach teeth. Their answers ranged from 0% (two schools) to 25.5% (Table 1).

The majority of those students who did receive the opportunity to bleach at least one tooth did so during comprehensive treatment of a particular patient, and not as an endodontic requirement. Patients with non-vital discolored teeth are a fairly common occurrence. Therefore, in private practice, most general dentists should be able to utilize the procedure. However, the number of patients needed to give each undergraduate dental student at least one clinical bleaching experience apparently are not available. This is especially true after the requirements for graduate endodontic students and postgraduate continuing education courses are met. Despite receiving lectures on bleaching, the vast majority of the students never have the opportunity to apply

the didactic phase clinically. The simple procedure described should allow most schools to correct this problem.

Ideally, the extracted teeth used for this procedure should be anterior teeth with "virgin" crowns. Premolars can also be used if anterior teeth are not available. As in a true clinical situation, the subsequent bleaching of an intact discolored crown will yield a more successful result than a crown compromised by loss of tooth structure with amalgam and/or composite restorations.

These teeth can be stained in bulk for a whole dental school class. After the teeth are stained, they can then be temporarily stored until ready to use by placing a cotton pellet in the chamber and sealing the access opening with a temporary restoration. The teeth should be stored in a humid environment to prevent desiccation.

When ready for use, a stained tooth can be mounted in a typodont by the dental student. The student can then proceed with the bleaching technique of choice in an attempt to lighten the shade of the discolored tooth.

This technique has also been used to conduct an in vitro research comparison of non-vital bleaching techniques in extracted discolored teeth.⁷

Conclusion

The bleaching of discolored non-vital teeth is an important phase of endodontic therapy. A technique for staining extracted anterior teeth has been described.

Ten teeth were prepared and stained. Each were stained darker than

the darkest shade guide tooth used. This technique should be of excellent value for both research and educational purposes.

MILITARY DISCLAIMER

Commercial materials and equipment are identified in this report to specify the investigative procedure. Such identification does not imply recommendation or endorsement, or that the materials and equipment are necessarily the best available for the purpose. Furthermore, the opinions expressed herein are those of the authors and are not to be construed as those of the Department of the Army or the Department of Defense.

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Table 1. Responses of endodontic department heads on number of undergraduate dental students having experience with at least one bleaching case.

Dental School	1	2	3	4	5	6
Class size	80	144	132	60	109	137
Students with bleaching cases	0*	0*	12**	12**	10-29**	30-35**
Percentage	0	0	9	20	9.2-18.4	21.8-25.5

*Definite

**Approximation

LEGEND

- Fig 1.** Comparison of two experimental teeth prior to staining
 (A,C) and following staining (B,D).
- Fig 2.** Lightest and darkest shade guide teeth.

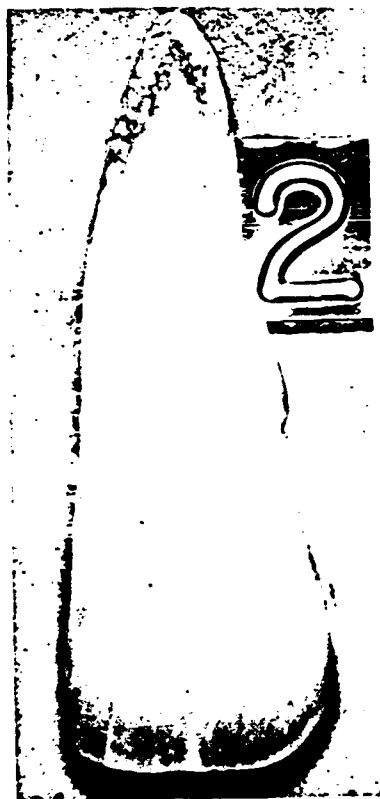


FIGURE 1A



FIGURE 1B

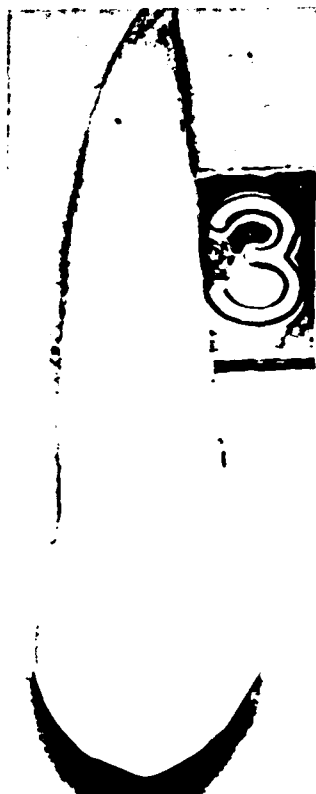


FIGURE 1C



FIGURE 1D

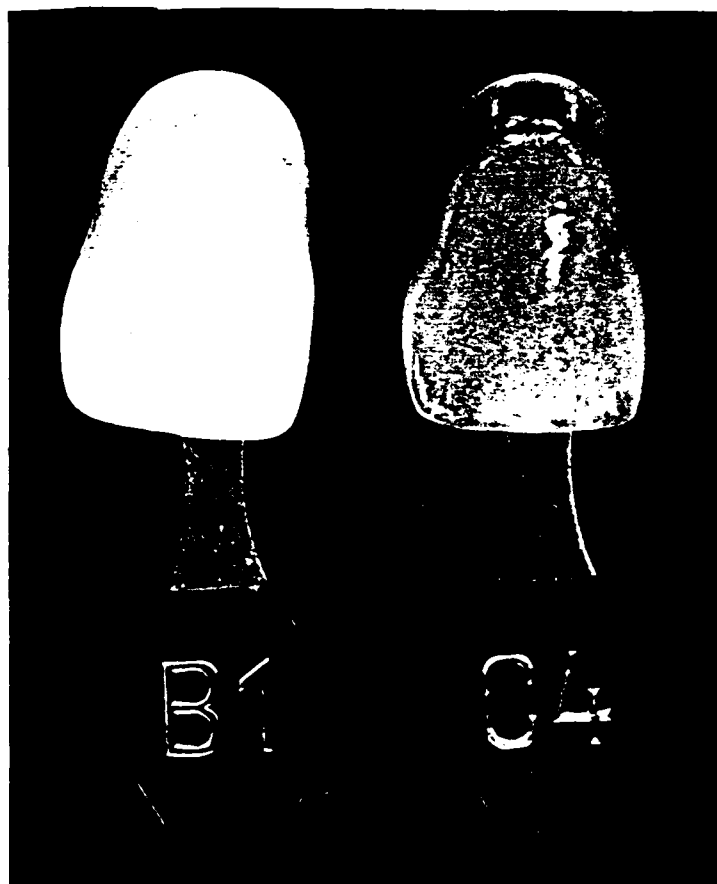


FIGURE 2

